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Morgan, Lewis & Bockius LLP  
1111 Pennsylvania Avenue, N.W.  
Washington, DC 20004

EXAMINER
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ABDI, AMARA

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12/27/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/765,130	<b>Applicant(s)</b> PARK ET AL.	
	<b>Examiner</b> Amara Abdi	<b>Art Unit</b> 2624	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 October 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>01/28/2004</u> .  | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

1. Applicant's response to the last office action, filed October 09, 2007 has been entered and made of record.
2. In view of the Applicant amendments, the objections to the drawing are expressly withdrawn.
3. In view of the Applicant amendments, the objection to the specification because of the Abstract is expressly withdrawn.
4. In view of the Applicant amendments, the objections to claims 1-11 are expressly withdrawn.

### **Remarks:**

5. Applicant's arguments with respect to claims 1-13, 15-28, 30-31 have been fully considered but they are not persuasive.

(a) The Applicant's argues that Itoh and Ichikawa whether taken individually or in combination, do not teach or suggest the claimed combination including at least a feature of "substantial angle detection circuitry capable of determining a substantial angle having the highest correlation based on filtered differential values of at least some of the pixel pairs". Furthermore, Ichikawa merely teaches using a 20dimensional filter, which is completely different from the present invention.

However, regarding claim 1, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the recursive filter) are not recited in the

rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

(b) The Applicant's argues that Itoh, ichikawa, Matsugu et al. and Bobrov et al., whether taken individually or in combination, do not teach or suggest the claimed combination including at least a feature of : "a first valley detector capable of comparing the differential values of consecutive sets of immediately adjacent pixel pairs within the selected region and determining a pixel pair having the differential value that is smaller than the differential values of available immediately adjacent pixel pairs to the left and to the right in the selected region", and the claimed "valley detector" is one of the implementation style of substantial angle detection circuit which serves to check adjacent angle detection result, and none of the applied references teaches or suggests using trend of angle detection result among the neighborhood results (such as result is increasing, decreasing or local minimum like valley shape, etc)

However, regarding claims 12 and 27, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., valley detector" is one of the implementation style of substantial angle detection circuit which serves to check adjacent angle detection result, and none of the applied references teaches or suggests using trend of angle detection result among the neighborhood results (such as result is increasing, decreasing or local minimum like valley shape, etc) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from

the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

**Claim Rejections - 35 USC § 103**

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1, 4-5, 7, 17, and 20-21 are rejected under 35U.S.C.103 (a) as being unpatentable over Itoh (US 6,810,156) in view of Ichikawa (US 5,881,164).

**(1) Regarding claims 1 and 17:**

Itoh disclose an image interpolation device (column 2, line 27) and method (column 13, line 25), for use in generating additional pixel data from input image data (column 2, line 34), where a window of input pixel data is used to generate data for an additional pixel to be placed substantially in the center of the window (column 2, line 36-42), (the window of input pixel is interpreted as an edge candidate detecting means), where the display image comprising:

Memory elements capable of receiving a chain of input pixel data and storing at least the window of input pixel data, the window of input pixels including a plurality of pixels pairs each of which respectively represents an angle of correlation (column 5, line 1-3);

Instant angle detection circuitry of receiving the input pixel data stored in the memory elements and determining an instant angle having the highest correlation based on differential values of at least some of the pixel pairs, wherein the differential value is the difference between the values of pixels in the pixel pair (column 5, line 3-6), (the examiner interpreted that the instant angle detection circuitry has the same function as a pixel comparator);

Angle confirmation circuitry capable of determining an interpolation angle based on the instant angle and the substantial angle (column 5, line 10-22), (the examiner interpreted that the angle confirmation circuitry has the same function as the combination of an edge detector and an edge verifier); and

An interpolator capable of determining the value of the additional pixel based on the value of pixels in the pixel pair corresponding to the interpolation angle (column 5, line 22-28), (the examiner interpreted that the interpolator data generator determines the value of the additional pixel, which the average of the two adjacent original pixels).

Itoh does not explicitly mention the substantial angle detection circuitry capable of determining a substantial angle having the highest correlation based on filtered differential values of at least some of the pixel pairs.

Ichikawa, in analogous environment, teaches an image data processing method and image data processing apparatus, where the differential values of the image memory are filtered in the line segment emphasis filter (column 3, line 54-57), (the substantial angle detection circuitry is read has the same function as the line segment emphasis filter).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Ichikawa, where using the line segment emphasis filter, in the system of Itoh because in such feature a stripped brightness non-uniformities of a very low contrast can be detected accurately, as well as the use for inspection of an LCD (liquid crystal display) panel by which rubbing stripes can be detected selectively (column 3, line 19-20; and line 23-24).

**(2) Regarding claims 4 and 20:**

Itoh discloses the generating as the interpolation angle the average of the instant angle and substantial angle (column 5, line 17-28).

Itoh does not disclose explicitly mention that the instant angle and the substantial angle are substantially equal to each other.

Ichikawa, in analogous environment, teaches an image data processing apparatus, where the instant angle (which is interpreted as the difference image memory) and the substantial angle (which is interpreted as line segment emphasis filter) appeared at equal interval (column 6, line 17).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Ichikawa, where that the instant angle and the substantial angle are substantially equal to each other, in the system of Itoh, because in such feature a stripped brightness non-uniformities of a very low contrast can be detected accurately, as well as the use for inspection of an LCD (liquid crystal display) panel by which rubbing stripes can be detected selectively (column 3, line 19-20; and line 23-24).

**(3) Regarding claims 5 and 21:**

Itoh discloses all the subject matter as described in claim 1, 17 above.

Itoh does not explicitly mention that the instant angle differs substantially from the substantial angle.

Ichikawa teaches an image data processing apparatus, where the substantial angle and the substantial angle substantially differs from each other (column 4, line 28-33).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Ichikawa, where the instant angle differs substantially from the substantial angle, in the system of Itoh, because in such feature a stripped brightness non-uniformities of a very low contrast can be detected accurately, as well as the use for inspection of an LCD (liquid crystal display) panel by which rubbing stripes can be detected selectively (column 3, line 19-20; and line 23-24).

**(4) Regarding claim 7:**

Itoh further discloses a system, where the instant angle detection circuitry includes:

A differential calculator capable of calculating differential value of at least some of the pixel pair in the window based on the pixel data stored in the memory elements (column 5, line 3-6), (the examiner interpreted that the instant angle detection circuitry has the same function as a pixel comparator).



8. Claims 2, 6, 18, and 22 are rejected under 35U.S.C.103(a) as being unpatentable over Itoh and Ichikawa as applied to claims 1 and 17 above, and further in view of Noguchi et al. (US 5,774,478).

**(1) Regarding claims 2 and 18:**

Itoh and Ichikawa disclose all the subject matter as described in claims 1 and 17 above.

Itoh and Ichikawa do not explicitly mention the determining of an image pattern, and do not disclose that the interpolation is based on the pattern image

Noguchi et al., in analogous environment, teaches an interpolation circuit for interpolating error data block, where the image pattern is determined (column 3, line 18-20), and the interpolation is based upon the arraying pattern estimated by the estimation means (column 3, line 21-24).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Noguchi et al., where determining of an image pattern, in the system of Itoh in order to enlarge the number of quantization bits from the current 16 bits to 20 or 24 bits for transmitting a high quality audio signals (column 1, line 29-35).

**(2) Regarding claims 6 and 22:**

Itoh and Ichikawa disclose all the subject matter as described in claims 1, 17, 2, and 18 above.

Itoh and Ichikawa do not explicitly mention the system, where a low pass filter is capable of filtering the interpolation angle and generating a filtered interpolation angle.

Noguchi et al., in analogous environment, teaches an interpolation circuit for interpolating error data block, where the analog filter is filtering the interpolated data and generating a filtered interpolation angle (column 6, line 46-49), (the interpolation angle is interpreted as the analog signal which is output at the monitor terminal).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Noguchi et al., where a low pass filter is capable of filtering the interpolation angle, in the system of Itoh in order to enlarge the number of quantization bits from the current 16 bits to 20 or 24 bits for transmitting a high quality audio signals (column 1, line 29-35).

9. Claims 3 and 19 are rejected under 35U.S.C.103(a) as being unpatentable over Itoh, Ichikawa, and Noguchi et al. as applied to claims 2 and 18 above, and further in view of Sakurai et al. (US PG PUB 2005/0254650), and Yamashita et al. (US 5,347,599).

Itoh, Ichikawa, and Noguchi et al. disclose all the subject matter as described in claims 1, 2, 17, and 18 above.

Itoh, Ichikawa, and Noguchi et al. do not explicitly mention the following items:

- 1) The regional measurement circuitry detects alphabets or numerical; and
- 2) The angle confirmation circuitry generates 90 degrees as the interpolation angle.

**A) Regarding item 1):**

Sakurai et al., in analogous environment teaches an authentication system, and method, where the background pattern determination part detects alphabets and

numerical characters (paragraph [0191], line 3-4) (the regional measurement circuitry is interpreted to have the same function as background pattern determination part).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Sakurai et al., where detecting alphabets or numerical, in the system of Itoh in order to have a high security where a widely popularized password composes of characters or numbers is used (paragraph [0007], line 4-9).

**B) Regarding item 2):**

Yamashita et al., in analogous environment teaches an adaptive interpolation method using correlation detection, where the angle confirmation circuitry generates 90 degrees as the interpolation angle (column 3, line 45).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Yamashita et al., where generating an interpolation angle of 90 degrees, in the system of Itoh in order to provides a high resolution interpolation free of noise (column 20, line 6-7).

10. Claims 8 and 23 are rejected under 35U.S.C.103(a) as being unpatentable over Itoh and Ichikawa as applied to claims 7 and 17 above, and further in view of Matsugu et al. (US 6,757,444).

Itoh discloses all the subject matter as described in claims 1, 7, and 17 above. (The examiner interpreted that angle finding circuitry has the same function as the instant angle detection circuitry recited in claim 1 and 17).

Itoh does not explicitly mention the system, where the angle detection circuitry includes the lowest valley search circuit capable of determining the pixel pair in the window of pixels with the lowest differential value.

Matsugu et al., in analogous environment teaches an image extraction apparatus method, where the pixel pair in the window of pixels is determined with the lowest differential value (column 27, line 65).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Matsugu et al., where determining the pixel pair in the window of pixels with the lowest differential value, in the system of Itoh, because such feature can stably extract a subject image independently of any specific difference between the image characteristics of the background and subject without being influenced by the background pattern (column 3, line 25-29).

11. Claims 10 and 25 are rejected under 35U.S.C.103 (a) as being unpatentable over Itoh and Ichikawa, as applied to claims 1 and 17 above, and further in view of Inoue (US-PGPUB 2002/0012477), and Matsugu et al. (US 6,757,444).

Itoh and Ichikawa disclose all the subject matter as described in claim 7 above.

Itoh and Ichikawa do not explicitly mention the following items:

1) a recursive filter capable of filtering the differential values of at least some of the pixel pairs in the window; and

2) the angle detection circuitry includes the lowest valley search circuit capable of determining the pixel pair in the window of pixels with the lowest filtered differential value.

**(A) Concerning item 1):**

Inoue, in analogous environment, teaches an image processing apparatus and recording medium, where using a recursive filter using outputs from the level difference correction value (paragraph [0095], line 4-5).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Inoue, where using a recursive filter, in the system of Itoh in order to implementing a stable correction of differences among partial images over the entire image even for a moving image (paragraph [0018], line 3-5).

**(B) Concerning item 2):**

Matsugu et al., in analogous environment teaches an image extraction apparatus method, where the pixel pair in the window of pixels is determined with the lowest filtered differential value (column 8, line 24-25; and column 27, line 65).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Matsugu et al., where determining the pixel pair in the window of pixels with the lowest filtered differential value, in the system of Itoh, in order to extract a subject image independently of any specific difference between the image characteristics of the background and subject without being influenced by the background pattern (column 3, line 25-29).

12. Claims 9, 24 and 26 are rejected under 35U.S.C.103 (a) as being unpatentable over Itoh, and Ichikawa, as applied to claims 7 and 17 above, and further in view of Bobrov et al. (US PG PUB 2003/0128894)

Itoh and Ichikawa disclose all the subject matter as described in claims 7 and 17 above. Furthermore, Itoh discloses the outputting of the instant angle in the differential value of the pixel pair (column 5, line 64), (the outputting of the absolute value is read as the same concept as the outputting of the instant angle) determined by the first valley detector is greater than or substantially the same as the difference value of the pixel, (the threshold is read as the difference value of the pixel) representing the correlation otherwise outputting the angle determined by the angle finding circuitry as the instant angle (column 10, line 58-61), (the threshold is read as the difference value of the pixel, and it is read that there will be an outputting of the instant angle when the instant angle if greater or the same as the threshold otherwise outputting the angle determined by the angle finding circuitry as the instant angle).

Itoh and Ichikawa do not explicitly mention the comparing of the differential value of the pixel pair.

Bobrov et al., disclose the comparing the differential values of adjacent pixels (paragraph [0088], line 6-7).

Bobrov et al. do not disclose expressly that the differential value of the pixel pair representing a 90 degree correlation.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the differential value of the pixel pair representing a 90 degree

correlation. Applicant has not disclosed that having the differential value of the pixel pair representing a 90 degree correlation provides an advantage, be used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with either the comparing the differential values of adjacent pixels taught by Smith or the claimed 9 where the differential value of the pixel pair representing a 90 degree correlation because both features perform the same function of comparing the differential values of adjacent pixel pairs.

Therefore, it would have been obvious to one having ordinary skill in the art to modify Bobrov et al. to obtain the invention as specified in claim 9.

13. Claims 12-13 and 27-28 are rejected under 35U.S.C.103 (a) as being unpatentable over Itoh in view of Ichikawa and Bobrov et al. (US PG PUB 2003/0128894)

**(1) Regarding claims 12 and 27:**

The same rejection of claims 1 and 17 applies to claims 12 and 17.

It is noted that Itoh, and Ichikawa, do not explicitly mention the system, where the first valley detector capable of comparing the differential values of consecutive sets of immediately adjacent pixel pairs within the selected region and determining a pixel pair having a differential value that is smaller than the differential value of available immediately adjacent pixel pairs to the left and to the right in the selected region.

Bobrov et al., in analogous environment, teaches a digital image analysis of reflecting markers, where comparing the differential values of adjacent pixels (paragraph [0088], line 6-7), and determining a pixel pair value having the differential value smaller than differential values of available immediately adjacent pixel pair in the selected region (paragraph [0088], line 18-19).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Bobrov et al., where comparing the differential values, in the system of Itoh because such feature uses form of binarization, which is more robust in comparison on the optical image light intensity oscillation of the image (paragraph [0088], line 22-23).

**(2) Regarding claims 13 and 28:**

Itoh, and Ichikawa and Bobrov et al. disclose all the subject matter as described in claims 12 and 27 above. Furthermore, Itoh discloses the outputting of the instant angle in the differential value of the pixel pair (column 5, line 64), (the outputting of the absolute value is read as the same concept as the outputting of the instant angle) determined by the first valley detector is greater than or substantially the same as the difference value of the pixel, (the threshold is read as the difference value of the pixel) representing the correlation otherwise outputting the angle determined by the angle finding circuitry as the instant angle (column 10, line 58-61), (the threshold is read as the difference value of the pixel, and it is read that there will be an outputting of the instant angle when the instant angle is greater or the same as the threshold otherwise outputting the angle determined by the angle finding circuitry as the instant angle).



Bobrov et al. do not disclose expressly that the differential value of the pixel pair representing a 90 degree correlation.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the differential value of the pixel pair representing a 90 degree correlation. Applicant has not disclosed that having the differential value of the pixel pair representing a 90 degree correlation provides an advantage, be used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with either the comparing the differential values of adjacent pixels taught by Smith or the claimed 9 where the differential value of the pixel pair representing a 90 degree correlation because both features perform the same function of comparing the differential values of adjacent pixel pairs.

Therefore, it would have been obvious to one having ordinary skill in the art to modify Bobrov et al. to obtain the invention as specified in claim 9.

14. Claim 11 is rejected under 35U.S.C.103 (a) as being unpatentable over Itoh and Ichikawa, as applied to claim 7 above, and further in view of Inoue (US-PGPUB 2002/0012477) and Bobrov et al. (US PGPUB 2003/0128894)

Itoh and Ichikawa disclose all the subject matter as described in claim 7 above. Furthermore, Itoh discloses the outputting of the instant angle in the differential value of the pixel pair (column 5, line 64), (the outputting of the absolute value is read as the same concept as the outputting of the instant angle) determined by the first valley

detector is greater than or substantially the same as the difference value of the pixel, (the threshold is read as the difference value of the pixel) representing the correlation otherwise outputting the angle determined by the angle finding circuitry as the instant angle (column 10, line 58-61), (the threshold is read as the difference value of the pixel, and it is read that there will be an outputting of the instant angle when the instant angle if greater or the same as the threshold otherwise outputting the angle determined by the angle finding circuitry as the instant angle).

Itoh and Ichikawa do not explicitly mention the following items:

1) a recursive filter capable of selecting a representative of at least some of the pixel pairs in the window; and

2) the comparing of the filtered differential value of the pixel pair determined by the first valley detector and the filtered differential value of the pixel pair representing 90 degree correlation.

**(A) Regarding item 1):**

Inoue, in analogous environment, teaches an image processing apparatus and recording medium, where using a recursive filter using outputs from the level difference correction value (paragraph [0095], line 4-5).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Inoue, where using a recursive filter, in the system of Itoh in order to implementing a stable correction of differences among partial images over the entire image even for a moving image (paragraph [0018], line 3-5).

**(B) Concerning item 2):**

Bobrov et al., disclose the comparing the differential values of adjacent pixels(paragraph [0088], line 6-7).

Bobrov et al. do not disclose expressly that the differential value of the pixel pair representing a 90 degree correlation.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the differential value of the pixel pair representing a 90 degree correlation. Applicant has not discloses that having the differential value of the pixel pair representing a 90 degree correlation provides an advantage, be used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with either the comparing the differential values of adjacent pixels taught by smith or the claimed 9 where the differential value of the pixel pair representing a 90 degree correlation because both features perform the same function of comparing the differential values of adjacent pixel pairs.

Therefore, it would have been obvious to one having ordinary skill in the art to modify Bobrov et al. to obtain the invention as specified in claim 9.

15. Claims 14 and 29 are rejected under 35U.S.C.103 (a) as being unpatentable over Itoh (US 6,810,156) in view Inoue (US-PGPUB 2002/0012477).

Itoh disclose an image interpolation device (column 2, line 27) and method (column 13, line 25), for use in generating additional pixel data from input image data

(column 2, line 34), where a window of input pixel data is used to generate data for an additional pixel to be placed substantially in the center of the window (column 2, line 36-42), (the window of input pixel is interpreted as an edge candidate detecting means), where the display image comprising:

Memory elements capable of receiving a chain of input pixel data and storing at least the window of input pixel data, the window of input pixels including a plurality of pixels pairs each of which respectively represents an angle of correlation (column 5, line 1-3);

A differential calculator capable of calculating a differential value of at least some of the pixel pairs in the window based on the input pixel data, wherein s difference value is the difference between the values of pixels in a pixel pair (column 5, line 3-6), (the examiner interpreted that the instant angle detection circuitry has the same function as a pixel comparator);

An interpolator capable of determining the value of the additional pixel (column 5, line 22-28), (the examiner interpreted that the interpolator data generator determines the value of the additional pixel, which is the average of the two adjacent original pixels).

Itoh does not explicitly mention the substantial angle detection circuitry capable of determining a substantial angle having the highest correlation based on filtered differential values of at least some of the pixel pairs, where the substantial angle circuitry includes a recursive filter capable of filtering the differential values of at least some of the pixels pairs in the window and outputting the filtered differential values

Inoue, in analogous environment, teaches an image processing apparatus and recording medium, where using a recursive filter using outputs from the level difference correction value (paragraph [0095], line 4-5).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Inoue, where using a recursive filter, in the system of Itoh in order to implementing a stable correction of differences among partial images over the entire image even for a moving image (paragraph [0018], line 3-5).

16. Claims 15-16 and 30-31 are rejected under 35U.S.C.103 (a) as being unpatentable over Itoh, Inoue, and as applied to claims 14 and 29 above, and further in view of Bobrov et al. (US PG PUB 2003/0128894).

**(1) Regarding claim 15 and 30:**

Itoh, Inoue disclose all the subject matter as described in claims 14 and 29 above.

Itoh, Inoue do not explicitly mention the system, where the first valley detector capable of comparing the differential values of consecutive sets of immediately adjacent pixel pairs within the selected region and determining a pixel pair having a differential value that is smaller than the differential value of available immediately adjacent pixel pairs to the left and to the right in the selected region.

Bobrov et al., in analogous environment teaches a digital image analysis of reflecting markers, where comparing the differential values of adjacent pixels (paragraph [0088], line 6-7), and determining a pixel pair value having the differential

value smaller than differential values of available immediately adjacent pixel pair in the selected region (paragraph [0088], line 18-19).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the system of Bobrov et al., where of comparing the differential values of consecutive sets, in the system of Itoh because such feature uses form of binarization, which is more robust in comparison on the optical image light intensity oscillation of the image (paragraph [0088], line 22-23).

**(2) Regarding claims 16 and 31:**

Itoh, Inoue, and Bobrov et al. disclose all the subject matter as described in claim 15 above. Furthermore, Itoh discloses the outputting of the instant angle in the differential value of the pixel pair (column 5, line 64), (the outputting of the absolute value is read as the same concept as the outputting of the instant angle) determined by the first valley detector is greater than or substantially the same as the difference value of the pixel, (the threshold is read as the difference value of the pixel) representing the correlation otherwise outputting the angle determined by the angle finding circuitry as the instant angle (column 10, line 58-61), (the threshold is read as the difference value of the pixel, and it is read that there will be an outputting of the instant angle when the instant angle is greater or the same as the threshold otherwise outputting the angle determined by the angle finding circuitry as the instant angle).

Bobrov et al., disclose the comparing the differential values of adjacent pixels.

Bobrov et al. do not disclose expressly that the differential value of the pixel pair representing a 90 degree correlation.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have the differential value of the pixel pair representing a 90 degree correlation. Applicant has not disclosed that having the differential value of the pixel pair representing a 90 degree correlation provides an advantage, be used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with either the comparing the differential values of adjacent pixels taught by Smith or the claimed 9 where the differential value of the pixel pair representing a 90 degree correlation because both features perform the same function of comparing the differential values of adjacent pixel pairs.

Therefore, it would have been obvious to one having ordinary skill in the art to modify Bobrov et al. to obtain the invention as specified in claim 9.

**Contact Information:**

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amara Abdi whose telephone number is (571) 270-1670. The examiner can normally be reached on Monday through Friday 7:30 AM to 5:00 PM E.T..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wu Jingge can be reached on (571) 272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Amara Abdi  
12/20/2007



JINGGE WU  
SUPERVISORY PATENT EXAMINER